

Alzheimer's Management System

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Abstract— Alzheimer's is a form of dementia that progressively leads to apraxia, aphasia and agnosia and ultimately leads to death. As of 2012, more than 5.1 million Americans are affected by Alzheimer's. The system aims at reducing the efforts of caregivers to overcome caregiver stress caused by prolonged hours of nursing the patient, improve cognitive functions of patients by triggering memories of their past and provide a one stop interface for physicians to analyze neurophysiological, neuropsychological and neuroimaging results for a patient accurately. The data collected in the system can be used in data mining and data analysis for further research to provide effective Medicare and possible cognitive solutions to the patients.

Keywords-Alzheimer's, Caregiver, Neurophysiology, Neuropsychology, Neuroimaging, Cognitive Functions, Data Mining, Data Analysis.

I. INTRODUCTION

The primary objective of the application is to assist the Physician and Caregiver in taking care and being informed of the Alzheimer patient's activities. The application has three main interfaces and provides access for three users - Physician, Caregiver and Patient.

Physician interface - The physician interface displays the neurophysiological, neuropsychological and neuroimaging results of the patients. The Physician will be able to compare and analyze the results of different patients.

Caregiver interface - The caregiver interface has details about the location of the patient at any given point. It allows the caregiver to monitor the progress of the patient that will reduce the symptoms and to set crucial reminders for the patient.

Patient interface - The Patient interface is a personalized view based on the user. It displays the reminders that are set by the Caregiver to the particular patient and has the Cognitive exercises assigned to the Patient.

II. PHYSICIAN

The physician interface is a single interface that aids the physician to compare and analyze neurophysiological, neuropsychological and neuroimaging results of a patient.

The interface will consider all the criteria mentioned by National Institute of Neurological and Communicative Disorders and Stroke and the Alzheimer's disease and Related Disorders Association (NINCDS-ADRDA) except the neuropathological test results for clinical diagnosis of Alzheimer's for a patient that will be the standard followed by the physician in administering the patient.

Interface

2.1 Neurophysiological studies - For each patient, Electroencephalogram (EEG) test results are recorded and saved in database and the abnormalities are tracked and provided to physician for further analysis.

2.2 Talairach coordinates taken from the scan details of the patients are stored as geometric spatial coordinates. These coordinates are taken at different points of time and once these coordinates are loaded into the database, accurate deviations in size of brain can be analyzed from the scans.

2.3 Neurochemical studies - Studies using Alz50 and Western Blot can analyze the presence of neurofibrillary tangles and senile plaques in the cerebrospinal fluid of affected persons.

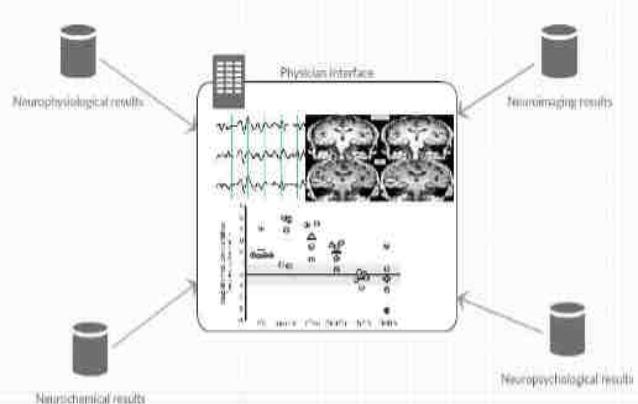


Fig. 1. Physician Interface to Analyze Neurological Results

III. CAREGIVER

The primary objective of this interface in the application is to reduce the stress of the caregiver who is taking care of the patient affected with Alzheimer. Caregivers spend on an average 47 hours a week taking care of the patient.

Alzheimer patients are provided care either by their own family members or a paid caregiver. The average cost incurred from paid and unpaid service to patients is approximately \$77,447 every year. Apart from the cost incurred for patient care, caregivers also report a lot of health issues in their lives. They also feel that their social life and the time spent with their family is affected.

About 32% of caregivers report deterioration in their health, taking care of an Alzheimer patient. Caregivers report the following health issues

- a) Fatigue
- b) Headaches
- c) Back pain
- d) Sleeping difficulty
- e) Weight gain
- f) Symptoms of Depression

The professional life of a caregiver is also severely affected in this process. They are forced to take a lot of time off their professional duties. In extreme circumstances, they are even forced to turn down or quit a good job to take care of their family member. This application will enable caregiver to monitor the patient remotely.

It is important for caregivers to live a normal and stress free life in the process of taking care of their loved ones. The caregiver interface aims to help the caregiver to keep track of the patient's activities. It will also help reduce the emotional burden and stress of the caregiver.

Interface

Our application enables the caregiver to monitor the progress of the patient's recovery.

- a) The caregiver will also be able to continuously keep track of the location of the patient.
- b) He/she will be able to enter the list of daily activities to be performed by the patient.
- c) Caregiver can also add videos, photos or other music files that could trigger the memories of past events, which helps in slowing down the progression of the disease.

IV. PATIENT

As the disease progresses, patient goes through severe stress and depression. Studies have revealed that listening, recreating, improvising and composing music can help patients to overcome depression and aid in slowing down the disease progression. Studies have also revealed that family photos and videos could help patients in overcoming dementia. The interface primarily includes music contents, family images and scrapbooks to reduce the symptoms in patients and to lower the depression.

Interface

The Patient Interface allows the patient to access the set of reminders or activities assigned to him by a caregiver. Various activities include dieting, medication and common household activities. Interface also allows patients to take up music therapy and cognitive exercises assigned by their caregivers. The interface has a GPS tracker that accurately keeps track of patient's location and loads them to the database in geographical spatial coordinates. The location of the patient can be monitored by the caregiver from a remote location.

V. CONCLUSION

The system will aid all three primary actors related to Alzheimer's – physicians, caregivers and patients.

Overall benefits achieved from the system include:

Physician - One stop solution to analyze all results for a particular patient and the ability to analyze the level progression for different patients through their results.

Caregiver – Decreasing the stress level of a caregiver thereby reducing the need for a caregiver partially.

Patient – Accurately tracks the patient location, triggers periodical reminders set for a patient and allows patient to take up music therapy and cognitive exercises.

VI. FUTURE SCOPE

Neurological results collected from different patients can aid in analyzing possible trends followed by the disease. The trends could further help in research works related to drug enhancements, clinical trials and potential long term cure for the disease. Neuroimaging captured through geometric spatial coordinates from different patients at different interval of time can be used to analyze the effect of drugs prescribed and cognitive exercises suggested for different patient groups. The graph below depicts the percentage change in size observed in two different patients from scans taken at different intervals.

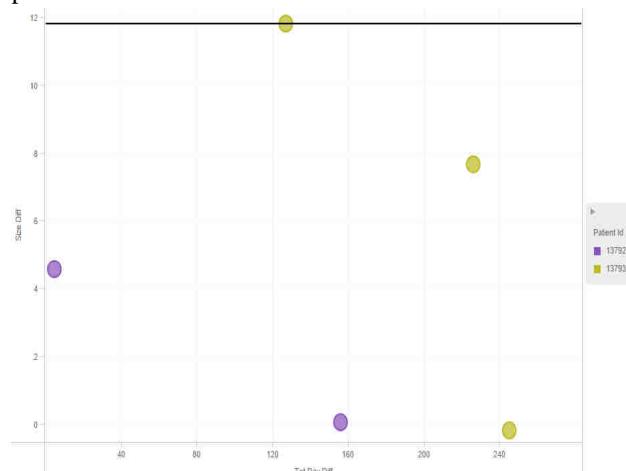


Fig. 2. Percentage Change in Brain Size Observed from Scans of Two Different Patients

VII. ACKNOWLEDGMENTS

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